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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/873,931	06/04/2001	Robert D. Horning	H16-16009 US	4429

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John G. Shudy, Jr.
Patent Services
Honeywell International Inc.
101 Colombia Road
Morristown, NJ 07962

EXAMINER

RAO, SHRINIVAS H

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 06/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/873,931

Applicant(s)

HORNING ET AL.

Examiner

Steven H. Rao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 April 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 19-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 19-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Response to Amendment

Applicants' amendment filed on April 07, 2006 has been entered and forwarded to the examiner on April 13, 2006.

Therefore claim 19 as amended by the amendment and claims 20-27 as previously recited are currently pending in the Application.

Claims 1-18 and 28-36 have been cancelled.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 19-22 are rejected under 35 U.S.C. 102(e) as being anticipated by Wu et al. (U.S. Patent No. 6,689,211, herein after Wu).

With respect to claim 19 Wu describes a device produced to the method of making a silicon micromechanical structure, comprising the steps of :
forming a lightly doped silicon substrate having a first and second side (Wu fig.1 D substrate #132) and having less than $5 \times 10^{19} \text{ cm}^{-3}$ boron therein (Wu col.4 line 29);
placing a strain compensated p+ layer on the first side of said substrate by doping with boron and germanium to form an etch stop (Wu figure 1 D 134 over 132 , claims 1, 2) ,
said p+ having a boron content of greater than $7 \times 10^{19} \text{ cm}^{-3}$ (Wu col.4 lines 35) and a germanium content of no more than about $1 \times 10^{21} \text{ cm}^{-3}$ (Wu col. 10 lines 50-55) ;
forming a mask on the second side for etching a predetermined pattern (Wu col. 8 lines 65, 33-37 , etc.) ; etching said second side to said p+ layer to form a silicon diaphragm (Wu col. 2 lines 22 to 50, col. 1 line 19-20) ; depositing an insulator on said p+ layer (Wu figs. 10-11F) and fabricating an electronic component as an micromechanical structure on said insulator. (col.1 lines 13 to 30).

With respect to claim 20 Wu describes the device of claim 19, wherein said boron content is greater than $1 \times 10^{20} \text{ cm}^{-3}$ (WU claims) and the germanium content is from about $0.5 \times 10^{21} \text{ cm}^{-3}$ to about $2.0 \times 10^{21} \text{ cm}^{-3}$. (Wu col. 10 lines 50-55, figure 8 etc.)

With respect to Claim 21 Wu describes the device of claim 19, wherein said micromechanical structure is a pressure sensor. (Wu col. 1 lines 15-20)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

A. Claims 22, 24 -27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (U.S. Patent No. 6,689,211, herein after Wu) as applied to claims 19-22 above and further in view of Stemme et al. (U.S. Patent No. 6,546,084, herein after Stemme).

With respect to claim 22 Wu (col. 1 lines 19-22 etc.) describes the device of claim 21, wherein said electronic component is selected from the group consisting of resonant microbeams , but does not specifically describe a dielectrically isolated piezoresistors

However Stemme , a patent from the same filed of endeavor, describes in Col.4 lines 11-12 and col. 7 lines line 14, etc. describes an electronic component is selected from the group consisting of dielectrically isolated piezoresistors and resonant microbeams to form ultraminiaturized sensors having high sensitivy in a cost effective manner .

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to specify Stemme's dielectrically isolated piezoresistors and resonant microbeams for the unspecified sensors of Wu in Wu's device to form ultraminiaturized sensors having high sensitivi in a cost effective manner . (Stemme col. 2 lines 38-48).

With respect to claim 24 describes the device of claim 23, wherein said electronic component is selected from the group consisting of dielectrically isolated piezoresistors and resonant microbeams. (Stemme col.4 lines 11-12 and col. 7 line 14).

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With respect to claim 25 describes the device of claim 19, wherein said micromechanical structure is a dual web biplane accelerometer formed by forming a said p+ layer on both sides of said substrate, forming a proof mask and flexure etching on both sides of said layer until said etching reaches said p+ layers.

With respect to claim 26 Wu describes the device of claim 25, wherein said electronic component is selected from the group consisting of dielectrically isolated piezoresistors and resonant microbeams. (Stemme col.4 lines 11-12 and col. 7 line 14).

With respect to claim 27 Wu describes the device of claim 19, wherein said micromechanical structure includes a dielectrically isolated piezoresistor formed on a top surface of a first wafer, a second wafer is bonded to said first wafer, and said second wafer forms a single crystal piezoresistor.(Stemme fig. 16 and col. 2 lines20-36).

B. Claim 23 is rejected Wu et al. (U.S. Patent No. 6,689,211, herein after Wu) and Stemme et al. (U.S. Patent No. 6,546,084, herein after Stemme).as applied above and further in view of Nilsson et al. (U.S. Patent No. 6,252,335, herein after Nilsson).

With respect to claim 23 Wu and Steeme describe the device of claim 19, wherein said micromechanical structure. Wu and Stemme do not specifically describe a cantilevered accelerometer.(Nilsson abstract line 1).

However Nilsson in its abstract line 1, etc. describes a cantilevered beam accelerometer to obtain a beam sensor that is small, very sensitive but with minimal orthogonal sensitivity and is highly resistant to shocks.

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Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Nilsson's cantilevered accelerometer as the beam sensor described by Wu and Stemme in their (WU and Stemme's) devices to obtain a beam sensor that is small, very sensitive but with minimal orthogonal sensitivity and is highly resistant to shocks. (Nilsson col. 1 lines 45 to 52).

Response to Arguments

Applicant's arguments filed 4/13/06 have been fully considered but they are not persuasive for the following reasons :

Applicants' first argument that Wu does not teach the placing of a p+ layer on the surface of the substrate that forms an etch stop is not persuasive because Applicants' arguments are not comensurate in scope with their presently recited claims .

Applicants' by stating Wu's layers only serve as an etch stop layer after 18% germanium is reached are compleety missing the point of Wu's teachings.

Wu in col. 4 lines 15-35 states :

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At high enough quantities, the effects of any dissimilar-sized substitutional atom on the silicon microstructure are the same as those of boron. Of course, the impact depends on the relative size and concentration of the substitutional species. Also, incorporation of a larger atom than silicon, e.g., germanium, would result in compressive stress and strain rather than a tensile situation like Si:B.

In the conventional etch stop process, extremely high concentrations of boron are needed to achieve a high etch rate selectivity. These very high boron concentrations lead to dislocation introduction in the thick films that are desired in many MEMS applications. Since the p++ process is created usually through a diffusion process, there is a gradient in dislocation density and a gradient in the boron concentration. Because the etch stops in the boron concentration gradient, the thin film part typically possesses large curvature, which is compensated for by an annealing treatment. In addition, the etch stop selectivity is extremely sensitive to the boron concentration. If the concentration falls below the critical $7 \times 10^{19} \text{ cm}^{-3}$, the selectivity is drastically different. Thus, since this boron concentration is near the solubility limit, dopant concentration fluctuations in the vertical and lateral dimensions produce low yields in MEMS processes. The SiGe etch stop breaks the link between dopant concentration and etch selectivity. Also, since the SiGe alloy is a miscible alloy system, there is continuous complete solubility between Si and Ge.

Therefore Wu entire teaching is based on substituting high Boron content for low Boron content.

Applicants' next contention that Wu first five layers would not function as etch stop because Wu states "It is noted, in addition, that Wu states that solutions etch any silicon containing less than $7 \times 10^{19} \text{ cm}^{-3}$ of boron or undoped Si-Ge alloys with x less than approximately 18" is irrelevant and not consummate in scope with Applicants' present claims All of which recite Boron concentration greater than $7 \times 10^{19} \text{ cm}^{-3}$, thus any property (assuming Applicants' contentions are true) are irrelevant to present claims.

Applicants' contention that Wu does not teach a strain compensated p+ Layer is wrong. Similar to applicants P+ layer (i.e. a silicon layer doped with boron and Ge) Wu describes the identical layer beginning with title etc.

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Therefore all of Applicants' arguments are not persuasive .

Therefore claims 19-27 are finally rejected.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. Rao whose telephone number is (571)272-1718. The examiner can normally be reached on 8.00 to 5.00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Fahmy Wael can be reached on (571) 272-1714. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

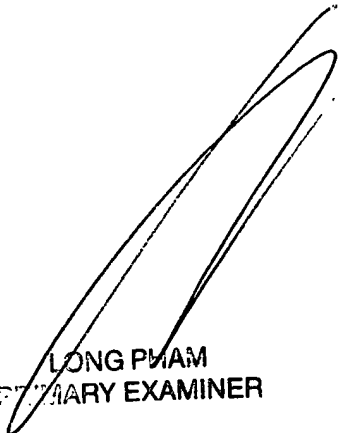
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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Steven H. Rao

Patent Examiner

June 13, 2006.



LONG PHAM
PRIMARY EXAMINER